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UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Marketing Service

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PROCESSED FOODS STANDARDIZATION AND INSPECTION SECTION

INSPECTORS' INSTRUCTIONS

DETERMINATION OF MATURITY BY BRINE FLOTATION

The maturity of various commodities, notably canned and frozen peas, may be determined by floating in salt (NaCl) solution of various densities. Numerous experiments, conducted throughout the country by the Processed Foods Standardization and Inspection Section have verified this fact. (1)

The determination is based on the fundamental fact that as peas and certain other vegetables pass through the stages of development, they become progressively more starchy, with a consequent relatively higher density. (2)

The method is applied commercially with the use of brine separator equipment, by which the peas, before canning, are segregated into maturity grades. (3)

Certain factors may tend to make unreliable the results of the brine flotation method when applied to peas in the laboratory. Among these are the presence of air pockets between the skin and cotyledons, differences in temperature between the peas and the test solutions, testing of broken or mashed peas, dilution of the solutions with pea liquor, and osmotic absorption of salt by the peas when allowed to remain in the test solution for a time before a count is taken. (4)

In the case of frozen peas occluded air beneath the skin is often present, and for this reason the skins are carefully removed before the maturity test is applied. (5)

When the brine flotation method is used, it is essential that the test solutions be properly and accurately made. It is advisable for each office engaged in inspecting peas to keep on hand a stock bottle of saturated salt solution. This is prepared in the following manner: (6)

Procure as nearly pure salt (Sodium Chloride - NaCl) as possible. Ordinary household salt, sold in packages, usually contains approximately 1% Magnesium Carbonate to make it "free running" and is not suitable for making up test solutions since the solution will possess a "milky" appearance. Salt for laboratory use is sold by many druggists and druggist supply houses. (7)

Pour salt thus obtained into a large, stoppered bottle until it is about one-third full and fill with tap water. There should always be a small quantity of undissolved salt at the bottom of the stock bottle to assure saturation of the solution. Thus when stock brine is withdrawn and additional water is added, additional salt should also be added. The stock solution at room temperature (approximately 68° F.) will contain approximately 26% of salt. Stock brine should be stored in the laboratory at room temperature. (8)

Test solutions may be made up in either of two ways. The first, and quicker, method is accomplished by diluting a measured quantity of stock solution with the measured quantity of water that will result in a solution of approximately the desired density. For example, since the stock solution contains approximately 26% salt, 100 cc diluted with 100 cc of water should produce a 13% solution. Likewise 100 cc diluted with 160 cc of water should produce a 10% solution. Test solutions so made must be carefully checked with the salometer and adjusted to exact density required. (9)

Test solutions may also be made up by progressive dilution of a quantity of stock solution until the desired density is obtained, as indicated by repeated salometer readings. (10)

It is always advisable, in making up test solutions, to draw off the water to be used for dilution and allow it to reach room temperature before the solutions are made up. This is necessary since tap water is often much colder than 68° F. and resultant solutions, if made from fresh drawn tap water, may be colder than the peas that are to be tested. This point is important because the density of salt solutions varies with the temperature as well as with the quantity of salt in solution. (11)

Salometers are of different types, some reading direct in percent of salt in solution, while others are graduated in degrees of salt. The degree salometer runs from 0° (pure water) to 100° (saturated salt solution - approximately 26% salt). The following conversion table for the two types of salometer will facilitate the use of either type available: (12)

Desired Solution	Percent Salometer Reading	Degree Salometer Reading
7%	7	27.0
8%	8	30.8
9%	9	34.7
10%	10	38.5
11%	11	42.4
12%	12	46.2
13%	13	50.0
14%	14	53.9
15%	15	57.8
16%	16	61.6
17%	17	65.5
18%	18	69.3
19%	19	73.2
20%	20	77.0
21%	21	80.9
22%	22	84.7

In reading a salometer spindle it is important to have the eye on a plane with the surface of the solution being tested and to read the salometer at the point on the plane of the solution surface. The solution will tend to "climb" the spindle and if the reading is taken at the top of the meniscus so formed, rather than at the surface of the solution, an inaccurate reading will be obtained. (13)

It is not always necessary to make up a complete set of solutions for each inspection (that is, in case of canned peas from 7% to 16% inclusive). With a little practice, the inspector will know upon examination of the peas the approximate solution that will be necessary to float them. For example, if the peas appear to be U. S. GRADE A, it may be advisable to make up only a 10% solution and from the results obtained, make up such additional solutions as may be necessary. (14)

A 250 cc glass beaker is a convenient container for use in floating the peas. Each office should also be equipped with a suitable dipper to remove the peas from the test solutions. (15)

Be sure that the commodity to be tested and the test solutions have reached room temperature before proceeding with the determination. (16)

In determining maturity of canned products, samples consisting of at least 50 units, free from breaks or cracks in the skin, from each container or package, should be floated in each solution used. Units should be placed in the solution ten at a time so that an accurate count of those that float or sink may be obtained. (17)

Due to the fact that the peas, or other commodity, take up the salt from the test solution, causing a "floater" to sink after a short time in the solution, a single sample should never be submerged in more than one solution. (18)

When large quantities are being inspected, it is also important that solutions be removed or re-tested at frequent intervals. This is made necessary because of the fact that the solutions are diluted by the vegetable liquor, thus resulting in inaccurate readings. (19)

Results of the flotation tests for canned peas should be record- ed on the back of the score sheet in a form such as the following: (20)

Code Mark	10% Solution			11% Solution			12% Solution			Score Point (for factor "Tenderness and Maturity"
	Float	Sink	% Sink	Float	Sink	% Sink	Float	Sink	% Sink	
71 G	12	38	76	26	24	48	50	0	0	33
71 H	42	8	16	50	0	0				35

The proper score point is determined from tables in the handbook articles covering the inspection of the commodity under consideration. A record similar to the above should be kept on the back of the score sheet for other commodities for which the brine flotation method is used. (21)